Effects of pH and temperature on the growth and ß-glucosidase activity of lactobacillus rhamnosus NRRL 442 in anaerobic fermentation

Abstract :

This study investigated the effects of pH and temperature on the growth and ß- glucosidase activity of Lactobacillus rhamnosus NRRL 442 during anaerobic fermentation. Initially, the ß-glucosidase activity of the cell harvested from shake flask culture was characterized. The result indicated the cell exhibited the highest specific ß-glucosidase activity (1.7990±0.0096 UE mg?-1 DCM) at pH 6.5 and 46oC. Subsequently, the effect of fermentation pH (range: 4.5-6.5) on cell growth and ß-glucosidase activity was investigated in 2-L bioreactor. Cell suppression due to acidity (pH = 4.5) was observed in fermentation with controlled and uncontrolled pH. Significant improvement of cell growth was found at higher pH (5.5-6.5). The cell exhibited the highest growth rate at pH 6 and highest ß-glucosidase activity (30.09 ± 0.16 UE, 4.16 times ß-glucosidase activity in uncontrolled fermentation). The optimum temperature for the fermentation in bioreactor was found to be 40oC for cell growth and ß-glucosidase activity. All profiles including studies on effect of pH and temperature indicated that the cells exhibited higher ß-glucosidase activity at higher growth rate. In addition, a short period of starvation (3h) enhanced the ß-glucosidase activity of the cell under all studied conditions except for fermentation where cell growth was suppressed due to acidity.